**BEFORE THE**
**FEDERAL COMMUNICATIONS COMMISSION**
**Washington, D.C. 20554**



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| In the Matter of | ) | |
| | ) | |
| Preparation for International | ) | IC Docket No. 94-31 |
| Telecommunication Union World | ) | |
| Radiocommunication Conference | ) | |



# COMMENTS OF
# LEO ONE USA CORPORATION



Robert A. Mazer
Rosenman & Colin
1300 19th Street, N.W., Suite 200
Washington, D.C. 20036
(202) 463-4640

March 6, 1995

Counsel to Leo One USA Corporation

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## SUMMARY

In these comments, Leo One USA discusses the need for additional allocations for the Non-Voice Non-Geostationary Mobile Satellite service ("NVNG MSS") and proposed improvements to the existing allocations and procedures for this service. Specifically, Leo One USA urges the Commission to propose an allocation of 10 MHz for the NVNG MSS. This requirement is supported by the market analysis provided by ITU-R Task Group 8/3 and the pending FCC NVNG MSS applicants. Leo One USA further believes that the allocation must be made at WRC-95. Otherwise, it will be extremely difficult for a competitive NVNG MSS industry to develop. It would also diminish the United States' ability to promote U.S. telecommunication technology and services abroad. With regard to the specific frequency to be allocated, Leo One USA suggests the following allocations: 387-390 MHz (space-to-Earth) and 450-457 MHz (Earth-to-space) or other appropriate uplink frequency. Leo One USA also urges the Commission to support proposals to allocate the 399.9-400.05 MHz (space-to-Earth) to the NVNG MSS. Finally, Leo One USA supports the elimination of the -150 dB(W/$m^2$/4kHz) PFD threshold contained in RR 608A and 608B and to change the allocation of the 149.9-150.05 band from land mobile-satellite service to a generic mobile satellite service. It also support the FCC proposed changes the Res. 46 coordination process.

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**COMMENTS OF**
**LEO ONE USA CORPORATION**

Leo One USA Corporation ("Leo One USA"), by counsel, hereby submits its Comments in response to the Commission's Second Notice of Inquiry ("Notice") regarding preparations for the International Telecommunications Union ("ITU") World Radiocommunication Conference ("WRC-95") to be held in Geneva, Switzerland later this year. Leo One USA is an applicant to construct, launch and operate a non-voice non-geostationary Mobile Satellite Service ("NVNG MSS") system in frequencies below 1 GHz.[1] The agenda for WRC-95 includes issues relating to the operation of NVNG MSS systems such as proposed by Leo One USA. Therefore, Leo One USA has a vital interest in the outcome of this Conference.

## I. Background

WRC-95 will consider changes to the international Radio Regulations ("RR") including possible new allocations and improvements to existing allocations and the

[1] See Application of Leo One USA Corporation File No. 57-DSS-P/L-48).

coordination process for NVNG MSS systems.[2] All of these issues will have a clear and direct impact on the emerging NVNG MSS industry and Leo One USA. The quantity and quality of spectrum will be the single most important factor in determining the industry's development. Specifically, it is abundantly clear that frequency will be the lifeline of this nascent industry. For instance, if additional frequency is not allocated at WRC-95 to the NVNG MSS, this service will be starved for competition and have minimal opportunity for growth. For the pending NVNG MSS applicants, this will diminish the possibility of obtaining a license and providing a competitive service. This will harm the United States' interest in promoting export of U.S. technology and services as well as the implementation of the global information infrastructure ("GII"). Given the above, Leo One USA urges the Commission to develop proposals that will allow the expeditious implementation of NVNG MSS systems. In these comments, Leo One USA discusses the need for additional allocations for the NVNG MSS and proposed improvements to the existing allocations and regulatory procedures for this service.

## II. Allocations For The NVNG MSS AT WRC-95

If NVNG MSS systems are to be implemented and allowed to flourish, it is imperative that additional allocations are made at WRC-95.[3] Leo One USA agrees with the Industry Advisory Committee ("IAC") that a minimum of 10 MHz of spectrum must be

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[2] See Final Acts of the World Radiocommunication Conference, Geneva 1993.

[3] The agenda for WRC-95 specifically provides for allocations to mobile satellite services, including the NVNG MSS. Id. at 3(d).

allocated at WRC-95. The following is an overview of this spectrum requirement, and what frequency can be allocated to this service.

### A. There Is A Requirement For An Allocation of 10 MHz For NVNG MSS

Since the 1992 WARC, studies have been undertaken by the ITU's Radiocommunications Sector ("ITU-R") on how to better provide for the needs for NVNG MSS systems. As part of that process, Task Group 8/3 ("TG 8/3") reported that an additional 7-10 MHz of spectrum is necessary for the NVNG MSS to meet service demand in the year 2000. This requirement is further supported by recent developments in the NVNG MSS service. In particular, since the time that TG 8/3 began to examine the need for new spectrum allocations, additional, and more thorough market analyses have been completed. While it was originally suggested that the capturable market for NVNG MSS services (that is, the number of transceivers that are likely to be served by NVNG MSS providers) would be approximately 6 million in North America by the year 2000, it is now clear that this number was very conservative. More recent marketing studies covering the utility, transportation, e-mail and information management sectors indicate a potential aggregate market substantially in excess of all previous estimates. Specific applications identified include container and trucking tracking, pipeline flow meter reading, remote paging, HAZMAT facility monitoring, ocean buoy data gathering, intrusion detection and a cost-effective means for emergency broadcast notification on a localized basis. Allowing for competitive terrestrial and satellite alternatives, the North American market for NVNG

MSS systems is anticipated to be at least 13 million subscribers by the year 2000.[4] Market demand is expected to grow significantly after that date.

The size of the market is supported by the growing number of systems that have been proposed worldwide. Today, there are 25 NVNG MSS satellite systems at some stage of notification/coordination before the ITU. In the United States, eight companies have prepared and filed applications (including the $250,000 filing fee) to construct, launch and operate these systems. This includes the five new systems (and requests for additional frequency from the first round applicants) that now comprise the FCC's second processing round for this service. However, it is clear that there is not sufficient spectrum available for the implementation of all the proposed systems in the current allocations.[5]

It is clear that at least 10 MHz of spectrum is necessary to meet this market requirements. TG 8/3 concludes that approximately 1.0 MHz of spectrum will serve 0.5 million subscribers.[6] Given the estimate of 6 million subscribers in North America alone predicted in the year 2000 and the above TG 8/3 analysis on spectrum requirements, this 10 MHz is easily justified.

### B. The Allocation Must Be Made At WRC-95

In light of a market requirement in North America of approximately 6 million subscribers in the year 2000, it will be necessary for the allocations to be made this year.

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[4] Leo One USA believes that the potential market for NVNG MSS services to be approximately 53 million subscribers in the U.S. domestic market.

[5] Leo One USA believes that it is likely that only one additional global system such as proposed by Leo One USA can be accommodated in the existing spectrum.

[6] See Document CPM 95/6-E, 3 January 1995 at 108.

This is because it will take five years to design, finance, construct, launch and fully implement an NVNG MSS system with dozens of satellites, such as proposed by Leo One USA. If the allocation is made in November 1995, it is likely that licenses would not be issued until sometime in 1996. It would take approximately eighteen months to two years, after receiving a license, for a new applicant to launch its first satellite.[7] This means at the earliest, Leo One USA could not begin to provide service until late 1998. It would take at least another two years to fully implement all 48 satellites of the proposed Leo One USA system. Thus, if the Leo One USA service is to be fully available using new frequencies by the year 2000, allocations must be made in 1995.

If there is no allocation in 1995, the next chance for an allocation will be 1997. This would have a number of detrimental effects. First, the pending FCC NVNG MSS applicants would have to wait until 1998 at the earliest to obtain a license. This would be approximately five years after Leo One USA filed its application and during this time, unlike the first round applicants, there is no way for Leo One USA to move forward because it will not know if it is to be awarded a license. Regulatory uncertainty is the biggest impediment to the capital formation necessary to support a competitive marketplace for the user. This will only result in providing the first round applicants with a significant competitive advantage and at the same time allow a monopoly or at best a duopoly market

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[7] It has taken ORBCOMM approximately three years since the frequency was allocated for it to be ready to launch a satellite and initiate service. However, it should be noted that ORBCOMM had a high degree of confidence that it would receive a license after September 1992 when the NVNG MSS Negotiated Rulemaking Committee came to a spectrum sharing agreement. The applicants in the second round NVNG MSS proceeding are not likely to have that luxury until the license is actually issued by the Commission. Thus, if an allocation is not made at WRC-95, the earliest the second round systems could be fully operational is in 2002-2003.

to become entrenched for this service. Certainly, such a situation is not in the interest of the public because it will only result in minimizing competition. This will create a situation where operators can charge prices unrelated to costs without any incentive to provide innovative services and technology. Second, if the allocation is not made at WRC-95, the market requirements described in TG 8/3 and the pending applications will remain unfulfilled. Thus, potential users will have to use less efficient or more costly solutions to meet their telecommunication needs. This will certainly require potential users of this service to operate less efficiently. Third, the United States is at the forefront in developing NVNG MSS technology and the new important export service industry. A lack of new spectrum allocated at WRC-95, that can be utilized by U.S.-based NVNG MSS systems, will limit U.S. participation in this new industry to at least two global commercial service providers. This will allow other countries to catch up to the United States which could have a negative impact on United States trade. It is even possible that NVNG MSS systems authorized by other administrations may have spectral advantages over U.S. NVNG MSS systems because of their ability to use more spectrum to serve markets outside the U.S. Finally, a delay would be inconsistent with existing United States policy to promote the development of the GII. A global satellite system such as that proposed by Leo One USA will be an integral part of the GII. For these reasons Leo One USA strongly believes that the United States must propose specific allocations for the NVNG MSS at WRC-95.

### C. Criteria For Selecting Frequencies

A number of factors must be applied to the selection of frequency spectrum for NVNG MSS systems. First, the frequency allocation should be useable around the globe

in a consistent manner in order for all countries to be able to access this fast growing service on an equal basis. Second, the frequency selected must be shareable with existing users. Leo One USA has reviewed the bands below 1 GHz and recognizes that most frequency between 100 MHz and 1000 MHz is extensively used. Therefore, if there is to be an allocation, the NVNG MSS systems should be required to operate compatibly with existing users in the bands. Otherwise, it will be extremely difficult to obtain an allocation. Third, bands must be selected that can be effectively utilized by the NVNG MSS. This service depends upon being able to produce an inexpensive mobile user terminal in order for it to be economical for high volume use, such as vehicle or cargo tracking. Frequencies in the VHF/UHF band are particularly well-suited to low-cost terminal production. The use of higher frequencies approaching 1 GHz, puts upward pressure on terminal prices, thereby diminishing the utility of the low-cost messaging band. It should be noted that as the frequencies increase toward 1 GHz, the terrestrial noise (e.g., ignition and machinery) decreases. Thus, it would be optimal to allocate spectrum in the 300-500 MHz range. Fourth, it is highly desirable to have a minimum of 5% to 7% separation between uplink and downlink bands. If the uplinks and downlinks used the same frequencies, then whenever the satellite transmitter operated, it would jam the satellite receiver, and similarly the subscriber terminal transmitter would jam the subscriber terminal receiver. Sufficient frequency separation is required between the uplinks and the downlinks to allow for effective filtering of the satellite transmit signal (downlink frequency) at the satellite receiver (uplink frequency), and similarly of the subscriber terminal transmit signal (uplink frequency), at the subscriber terminal receiver (downlink frequency). A minimum frequency separation of 5% to 7% allows for the use of filters with reasonable cost, size, and weight.

Smaller separations would result in significantly more expensive satellites due to the increased weight and size, and preclude the use of hand-held subscriber terminals also due to the increased weight and size. Given the above criteria, Leo One believes that the optimum frequency for NVNG MSS should be between 100 MHz and 500 MHz with a separation of at least 5% to 7% between the uplink and downlink bands.

### D. Frequency Bands For NVNG MSS Systems

At the outset, it should be noted that the requirements for uplink spectrum are different than for downlink spectrum. Specifically, for FDMA type systems, it is necessary to find dedicated spectrum for downlinks because receivers on the ground cannot operate in the presence of large interfering sources. Frequency sharing of NVNG MSS downlinks with fixed and mobile services is problematic. Weak signals from satellites hundreds of kilometers away are drowned out by strong signals from nearby fixed and mobile transmitters. To avoid coordination with terrestrial services, NVNG MSS downlinks are limited to a peak flux density of -125 dB($W/m^2$/4kHz) at the Earth's surface. A fixed or mobile transmitter operating at 25 W in a 25 kHz channel produces a flux density of -105 dB($W/m^2$/4kHz) at a distance of 100 km assuming free space propagation. This results in a C/I of -20 dB at the subscriber terminal, completely jamming the downlink signal from the satellite. Even allowing for 30 dB of excess path loss between the terrestrial transmitter and the subscriber terminals, terrestrial signals would still jam the satellite downlink signal. Thus, it is difficult for NVNG MSS systems to share downlink bands with extensively used services. On the other hand, satellite uplink receivers can operate with other services because terrestrial transmitters do not cause a significant amount of interference to the

satellite and the satellite is able to scan over a wide geographic area to find open channels.

In light of the different requirements for uplink and downlinks it is not necessary to have exactly the same amount of spectrum for the uplink and the downlink. For instance, a downlink allocation of approximately 3 MHz and an uplink allocation of 7 MHz would be sufficient for NVNG MSS systems. In fact, it should be noted that the wider the uplink allocation, the more likely that systems can easily share with existing users.

A significant amount of work has been done by the early NVNG MSS applicants within the ITU-R to demonstrate the ability of their systems to share with fixed and mobile users and other satellite services since the initial allocation in 1992. MSS systems have a fair degree of flexibility and can be tailored to a significant degree to share with intermittent users in bands that are not saturated with radio energy.

Fixed and mobile services are generally the most shareable services since the nature of their use is by definition intermittent, thereby allowing use of the frequencies for very brief transmissions, such as those satellite networks using FDMA technology. Additionally, these services generally operate using narrow channels. Terrestrial fixed and mobile systems operating in other bands typically operate with the same 25 kHz channelization as do those systems operating in the 148-149.9 MHz band. NVNG MSS systems can readily find open channels in the interstitial area between adjacent fixed and mobile channels. Thus, the same dynamic channel assignment schemes that work in the 148-149.9 MHz band will work in other fixed and mobile bands.

On the other hand, bands with persistent high powered transmitters, such as radar systems, do not allow either the frequency hopping FDMA nor the spread-spectrum type mobile satellite systems to operate efficiently. Bands containing Radio Astronomy

allocations are less desirable for MSS systems due to the potential for causing harmful interference to the very sensitive Radio Astronomy receivers located close to an MSS allocation.

The following is a review of bands that Leo One USA believes that the United States should consider including in its allocation proposals for WRC-95.

### 1. Downlink

387 - 390 MHz: This band is allocated to the fixed and mobile services and used by government. It also is allocated on secondary basis by the ITU to the mobile-satellite service in the space-to-Earth direction.[8] Additionally, in the United States, this band is allocated on a primary basis to the mobile-satellite service, limited to military operations.[9] Thus, this band is ideally suited for a downlink allocation.[10] Leo One USA strongly recommends that the United States formally propose to WRC-95 that this band be allocated by the ITU on a primary basis subject to Res. 46 coordination.

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[8] See Table of Frequency Allocations, 47 CFR §2.106 at International Footnote 641.

[9] Id. at G100.

[10] Although the band 225-400 is the most critical band for NATO, a number of CEPT countries are considering using the 380-400 MHz band for terrestrial public safety use. See Report of the Federal Communication Commission to Ronald H. Brown, Secretary, U.S. Department of Commerce, August 9, 1994.

2. **Uplink**

As stated above, uplink spectrum can be shared quite effectively with fixed and mobile services. Leo One USA urges the United States to propose an allocation of 7 MHz in one of the following bands:

- 138-144 MHz: This band is allocated to aeronautical mobile and space research in Region 1 and fixed and mobile and space research in Regions 2 and 3. This band would be used by FDMA systems in a dynamic channel avoidance scheme or by CDMA systems operating at low power.

- 157.0375-174 MHz: This band is allocated to fixed and mobile services in all three regions. In the United States, this band is used for commercial, non-government, private mobile and fixed radio services.

- 216-218 MHz and 219-220 MHz: These bands are allocated to broadcasting in Region 1, to fixed and maritime mobile in Region 2, and fixed and mobile broadcasting in Region 3. In the United States, these bands are moderately used on in-land waterways, primarily the Mississippi River. In Region 2, it may be an ideal band for NVNG MSS systems.

- 312-315: This band is the paired band to the 387-390 MHz band and is allocated in a similar manner including a secondary allocation to the mobile satellite service.

- 450-470 MHz: This band is used for fixed and mobile services in all regions and would be ideally suited for the NVNG MSS.

Although each of these frequencies presents different issues, Leo One USA believes that additional discussions can result in an agreement on specific proposals for allocating spectrum at WRC-95. An example of a proposal that would meet the needs of the NVNG MSS industry would be an allocation at 387-390 MHz (space-to-Earth) and 450-457 MHz (Earth-to-space).

Leo One USA also supports the FCC's preliminary proposal to allocate the 399.9-400.05 MHz to the NVNG MSS. Operations in this band will cease on January 1, 1997 making it ideal for this new service. However, Leo One USA believes, that since downlink

spectrum is at such a premium and the 400.15-401 MHz band is allocated for space-to-Earth, that the 399.9-400.05 MHz band should also be allocated to the NVNG MSS for space-to-Earth operations.

## III. Proposed Changes To Existing NVNG MSS Allocations

In the Notice, the Commission proposes to eliminate the -150 dB($W/m^2/4kHz$) PFD threshold for the 148-149.9 MHz band specified in RR 608A in favor of a coordination triggering mechanism. Specifically, the Commission supports requiring coordination of mobile Earth terminal operations only with administrations falling within a specified threshold distance of the implementing country's borders.[11] Leo One USA agrees with this proposal. The Notice also proposes to eliminate RR 608B for the 149.9-150.05 MHz band because there are no terrestrial allocations users in this band. Again, Leo One USA fully agrees with this proposal.

Leo One USA also agrees with the Commission's proposal to change the allocation for the 149.9-150.05 MHz band from land mobile-satellite service to a generic mobile-satellite service. This proposal will provide NVNG MSS system operators with maximum flexibility to provide different types of services. Given the nature and design of these systems, there is no inherent reason to restrict the allocations.

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[11] See ITU-R Document 8-3/TEMP/45/-F (Geneva 1994).

## IV. Regulatory Proposals

The Commission supports several proposals made by the IAC to improve the Res. 46 coordination process. Specifically, the IAC proposed that the information requirements of Appendix 3 be expanded so that instantaneous PFD levels can be calculated as a function of the elevation angle from a point on the Earth.[12] Leo One USA agrees. This proposal will reduce the number of other space and terrestrial systems that must coordinate with NVNG MSS systems. Such a result will allow the more efficient implementation of NVNG MSS systems. Leo One USA also agrees with the proposals to introduce an Appendix to Res. 46 specifying additional information on system operation. Leo One USA believes that any proposals that improve the Res. 46 coordination process are welcome.

## CONCLUSION

For the reasons discussed above, Leo One USA believes that it is imperative that the United States propose new frequency allocations for NVNG MSS systems at the WRC-95. Failure to make such proposals will have a detrimental impact on this emerging industry by limiting competition and future system development. Additionally, it will limit the United States' interest in promoting U.S. telecommunication technology and the GII. Additionally, Leo One USA supports the Commission proposals to eliminate the -150 dB($W/m^2/4kHz$)

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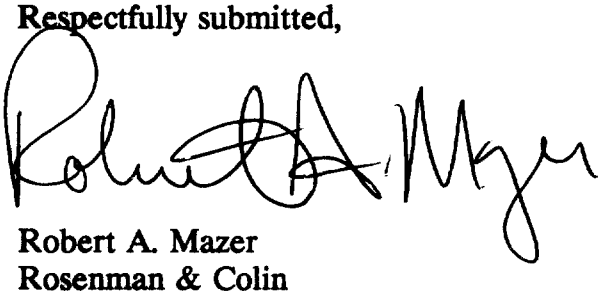
[12] See IAC Report at 69.

coordination trigger contained in RR 608A and 608B and proposals to improve the Res. 46 coordination process.

Respectfully submitted,



Robert A. Mazer
Rosenman & Colin
1300 19th Street, N.W., Suite 200
Washington, D.C. 20036
(202) 463-4640

March 6, 1995

Counsel to Leo One USA Corporation

## CERTIFICATE OF SERVICE

I, Robert A. Mazer, hereby certify that the foregoing "Comments of Leo One USA Corporation" was served by hand or first-class mail, postage prepaid, this 6th day of March, 1995, on the following persons:

Scott Blake Harris, Chief*
International Bureau
Federal Communications Commission
2000 M Street, N.W., Room 800
Washington, DC 20554

Thomas S. Tycz, Chief*
Satellite & Radiocommunication Division
International Bureau
Federal Communications Commission
2000 M Street, N.W. Room 520
Washington, DC 20554

Cecily C. Holiday, Deputy Chief*
Satellite & Radiocommunication Division
International Bureau
Federal Communications Commission
2000 M Street, N.W. Room 520
Washington, DC 20554

Fern J. Jarmulnek, Chief*
Satellite Policy Branch
Satellite & Radiocommunication Division
International Bureau
Federal Communications Commission
2000 M Street, N.W., Fifth Floor
Washington, DC 20554

Ms. Kristi Kendell*
Satellite Policy Branch
Satellite & Radiocommunication Division
International Bureau
Federal Communications Commission
2000 M Street, N.W., Fifth Floor
Washington, DC 20554

Albert Halprin, Esq.
Halprin, Temple & Goodman
Suite 650 East Tower
1100 New York Avenue, N.W.
Washington, DC 20005
(Counsel for ORBCOMM)

Raul R. Rodriguez, Esq.
Leventhal, Senter & Lerman
2000 K Street, N.W., Suite 600
Washington, DC 20006
(Counsel for STARSYS)

Henry Goldberg, Esq.
Goldberg, Godles, Wiener & Wright
1229 19th Street, N.W.
Washington, DC 20036
(Counsel for VITA)

Philip V. Otero, Esq.
Vice President & General Counsel
GE American Communications, Inc.
Four Research Way
Princeton, New Jersey 08540
(Counsel for GE Americom)

Leslie A. Taylor, Esq.
Leslie Taylor Associates
6800 Carlynn Court
Bethesda, MD 20817-4301
(Counsel for E-Sat, Inc.)

Albert J. Catalano, Esq.
Ronald J. Jarvis, Esq.
Catalano & Jarvis, P.C.
1101 30th Street, N.W.
Suite 300
Washington, DC 20007
(Counsel for Final Analysis)

Jill Abeshouse Stern, Esq.
Shaw, Pittman, Potts & Trowbridge
2300 N Street, N.W.
Washington, DC 20037
(Counsel for CTA)

John T. Scott, Esquire
William D. Wallace, Esquire
Crowell & Moring
1001 Pennsylvania Avenue, N.W.
Washington, DC 20004-2505

Norman R. Leventhal, Esquire
Raul R. Rodriguez, Esquire
Stephen D. Baruch, Esquire
Leventhal Senter & Lerman
2000 K Street, N.W., Suite 600
Washington, DC 20006-1809

Veronica Haggert, Esquire
Motorola, Inc.
1350 Eye Street, N.W.
Suite 400
Washington, DC 20005

Philip L. Malet, Esquire
Alfred M. Mamlet, Esquire
Steptoe & Johnson
1330 Connecticut Avenue, N.W.
Washington, DC 20036

Dr. T. Stephen Cheston
Mr. James G. Ennis
Mr. Barry Lambergman
Iridium, Inc.
1401 H Street, N.W.
Washington, DC 20005

Robert A. Mansbach
COMSAT Corporation
COMSAT World Systems
6560 Rock Spring Drive
Bethesda, MD 20817

John L. Bartlett, Esquire
Wiley Rein & Fielding
1776 K Street, N.W.
Washington, DC 20006

Leonard Robert Raish, Esquire
Fletcher Heald & Hildreth
1300 N. 17th Street, 11th Floor
Rosslyn, VA 22209

David A. Gross
AirTouch Communications
1818 N Street, N.W.
Washington, DC 20036

Thomas J. Keller, Esquire
Verner Liipfert Bernhard
McPherson & Hand, Chartered
901 15th Street, N.W., Suite 700
Washington, DC 20005
(Counsel for The Association of
American Railroads)

Tom W. Davidson, P.C.
Akin Gump Strauss Hauer & Feld LLP
1333 New Hampshire Avenue, N.W.
Suite 400
Washington, DC 20036
(Counsel for Teledesic Corporation)

Christopher D. Imlay, Esquire
Booth Freret & Imlay
1233 20th Street, N.W., Suite 204
Washington, DC 20036
(Counsel for The American Radio
Relay League, Incorporated)

Gary M. Epstein
John P. Janka
Mary E. Britton
Latham & Watkins
1001 Pennsylvania Avenue, N.W.
Washington, DC 20004
(Counsel for Hughes Space and Communications
Company and Hughes Communications Galaxy, Inc.)

Nancy J. Thompson
COMSAT Mobile Communications
22300 COMSAT Drive
Clarksburg, MD 20781

Molly Pauker, Vice President
Corporate & Legal Affairs
Fox, Inc. & Fox Television Stations
5151 Wisconsin Avenue, N.W.
Washington, DC 20016

Henry L. Bauman
Barry D. Umansky
Kelly T. Williams
National Association of Broadcasters
1771 N Street, N.W.
Washington, DC 20036

Howard Monderer
National Broadcasting Company
1229 Pennsylvania Avenue, N.W.
11th Floor
Washington, DC 20004

Howard N. Miller, Senior V.P.
Broadcast Operations, Engineering
and Computer Services
1320 Braddock Place
Alexandria, VA 22314
(Counsel for Public Broadcasting Services)

Julian L. Shepard
Victor Tawil
Assoc. for Maximum Service TV, Inc.
1776 Massachusetts Ave., N.W.
Suite 300
Washington, DC 20044

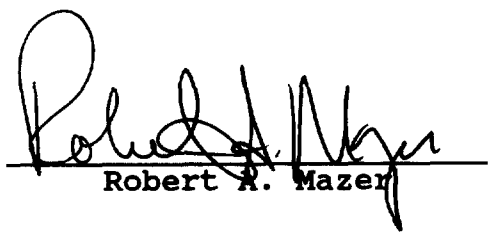
Jonathan D. Blake
Kurt A. Wimmer
Ronald J. Krotoszynski, Jr.
Covington & Burling
P.O. Box 7566
Washington, DC 20044
(Counsel for Association for Maximum Service Television, Inc.)

Sam Antar, Vice President
Law and Regulation
Capital Cities/ABC, Inc.
77 West 66th Street, 16th Fl.
New York, NY 10023

Mark W. Johnson
CBS, Inc.
1634 Eye Street, N.W.
Washington, DC 20006

J. Laurent Scharff
Reed Smith Shaw & McClay
1200 18th Street, N.W.
Washington, DC 20036

Charles W. Kelly, Jr., President
Society of Broadcast Engineers
8445 Keystone Crossing
Suite 140
Indianapolis, IN 46240

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* Hand Delivered